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**§ 84.1155 Filters used with canisters and cartridges; location; replacement.**

(a) Particulate matter filters used in conjunction with a canister or cartridge shall be located on the inlet side of the canister or cartridge.

(b) Filters shall be incorporated into or firmly attached to the canister or cartridge and each filter assembly shall, where applicable, be designed to permit its easy removal from and replacement on the canister or cartridge.

**§ 84.1156 Pesticide respirators; performance requirements; general.**

Pesticide respirators and the individual components of each such device shall, as appropriate, meet the following minimum requirements for performance and protection:

(a) *Breathing resistance test.* (1) Air-flow resistance will be measured in the facepiece, mouthpiece, hood, or helmet of a pesticide respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with paragraphs (c) and (f) of this section.

(2) The maximum allowable resistance requirements for pesticide respirators are as follows:

MAXIMUM RESISTANCE  
[mm. water-column height]

Type of pesticide respirator	Inhalation		Exhalation
	Initial	Final <sup>1</sup>	
Front- or back-mounted gas mask .....	70	85	20
Chin-style gas mask .....	65	80	20
Powered air-purifying <sup>2</sup> .....	<sup>2</sup> 50	<sup>2</sup> 70	20
Chemical Cartridge .....	50	70	20

<sup>1</sup> Measured at end of the service life specified in Table 14 of this subpart.

<sup>2</sup> Resistance of filter(s), cartridge(s), and breathing tube(s) only with blower not operating.

(b) *Facepiece test.* (1) The complete pesticide respirator will be fitted to the faces of persons having varying facial shapes and sizes.

(2) Where the applicant specifies a facepiece size or sizes for his respirator together with the approximate measurements of faces they are designed to fit, the Institute will provide test subjects to suit such facial measurements.

(3) Any pesticide respirator part which must be removed to perform the facepiece fit test shall be replaceable without special tools and without disturbing facepiece fit.

(4) The facepiece or mouthpiece fit test using positive or negative pressure recommended by the applicant and described in his instructions will be used during each test.

(5)(i) Each wearer will enter a chamber containing 1,000 p.p.m. isoamyl-acetate vapor for a respirator equipped with a full facepiece, mouthpiece, hood, or helmet and 100 p.p.m. isoamyl-

acetate vapor for a respirator equipped with a half-mask facepiece.

(ii) The facepiece, mouthpiece, hood, or helmet may be adjusted, if necessary, in the test chamber before starting the test.

(iii) Each wearer will remain in the chamber while performing the following activities:

(A) Two minutes, nodding and turning head;

(B) Two minutes, calisthenic arm movements;

(C) Two minutes, running in place; and

(D) Two minutes, pumping with a tire pump into a 28-liter (1 cubic foot) container.

(iv) Each wearer shall not detect the odor of isoamyl-acetate during the test.

(c) *Silica dust test.* Three completely assembled pesticide respirators will be tested with a mechanical-testing apparatus as follows:

(1) Temperature in the test chamber will be approximately 25 °C.

(2) Continuous airflow through the respirator will be 32 liters per minute for front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators, and not less than 115 (4 cubic feet) liters per minute to tight-fitting facepieces and 170 liters (6 cubic feet) per minute to loose-fitting hoods and helmets of powered air-purifying respirators.

(3) The test aerosol will contain 50–60 milligrams of 99+ percent free silica per cubic meter of air.

(4) The particle size distribution of the test suspension will have a geometric mean diameter of 0.4 to 0.6 micrometer, with a standard geometric deviation less than 2.

(5) Front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators will be tested for 90 minutes and powered air-purifying respirators will be tested for 4 hours.

(d) *Lead fume test.* Three completely assembled pesticide respirators will be tested with a mechanical-testing apparatus as follows:

(1) Continuous airflow through the respirator will be 32 liters per minute for front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators and not less than 115 liters (4 cubic feet) per minute, for powered air-purifying respirators with tight-fitting facepieces, and not less than 170 liters (6 cubic feet) per minute for powered air-purifying respirators with loose-fitting hoods and helmets.

(2) The test aerosol will contain 15–20 milligrams of freshly generated lead-oxide fume, calculated as lead, per cubic meter of air.

(3) The fume will be generated by impinging an oxygen-gas flame on molten lead.

(4) Front-mounted, back-mounted, and chin-style gas mask pesticide respirators and chemical cartridge pesticide respirators will be tested for 90 minutes and powered air-purifying pesticide respirators will be tested for 4 hours.

(5) The total amount of unretained test suspension, which is analyzed and calculated as lead, shall not exceed:

(i) 0.43 milligram for any 90-minute test;

(ii) 4.8 milligrams for any 4-hour test made at 115 liters (4 cubic feet) per minute; or

(iii) 6.2 milligrams for any 4-hour test made at 170 liters (6 cubic feet) per minute.

(e) *Diocetyl-phthalate test.* (1) All canisters submitted for use with front-mounted and back-mounted gas mask pesticide respirators will be tested in an atmospheric concentration of 100 micrograms of diocetyl-phthalate per liter of air at continuous flow rates of 32 and 85 liters per minute for a test period of 5 to 10 seconds.

(2) The DOP leakage through the canister shall not exceed 0.03 percent of the ambient DOP concentration.

(f) *Bench tests for pesticide respirators.* (1)(i) Bench tests will be made on an apparatus that allows the test atmosphere at 50 ±5 percent relative humidity and at room temperature (25°±2.5 °C.) to enter the canister or cartridge at predetermined concentrations and rates of flow, and that has a means for determining the test life of the canister or cartridge against carbon tetrachloride.

(ii) Canisters and cartridges will be tested as they are used on each pesticide respirator, either singly or in pairs.

(iii) Three canisters or cartridges or pairs of cartridges will be removed from containers and tested as received from the applicant.

(iv) Two canisters, cartridges, or pairs of cartridges will be equilibrated at room temperature by passing 25 percent relative humidity air through them at the following flow rates (expressed as liters per minute (l.p.m.)) for 6 hours:

Type of canister or cartridge	Airflow rate, l.p.m.
Air-purifying canister .....	64
Air-purifying cartridge .....	25
Powered air-purifying with tight-fitting facepiece ...	115
Powered air-purifying with loose-fitting hood or helmet .....	170

(v) Two canisters, cartridges, or pairs of cartridges will be equilibrated at

room temperature by passing 85 percent relative humidity air through them at the flow rates stated in paragraph (f)(1)(iv) of this section for 6 hours.

(vi) The equilibrated canisters or cartridges will be resealed, kept in an upright position at room temperature, and tested within 18 hours.

(2) Canisters and cartridges tested in accordance with the provisions of this section shall meet the requirements specified in Table 14 of this subpart.

**§ 84.1157 Chemical cartridge respirators with particulate filters; performance requirements; general.**

Chemical cartridge respirators with particulate filters and the individual

components of each such device shall, as appropriate, meet the following minimum requirements for performance and protection:

(a) *Breathing resistance test.* (1) Resistance to airflow will be measured in the facepiece, mouthpiece, hood, or helmet of a chemical cartridge respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with paragraphs (d) through (f) of this section.

(2) The maximum allowable resistance requirements for chemical cartridge respirators are as follows:

MAXIMUM RESISTANCE  
[mm. water-column height]

Type of chemical cartridge respirator	Inhalation		Exhalation
	Initial	Final <sup>1</sup>	
For gases, vapors, or gases and vapors, and dusts, fumes, and mists .....	50	70	20
For gases, vapors, or gases and vapors, and mists of paints, lacquers, and enamels	50	70	20

<sup>1</sup> Measured at end of service life specified in Table 11 in subpart L of this part.

(b) *Facepiece test.* The facepiece test will be conducted as specified in § 84.205.

(c) *Lacquer and enamel mist tests; general.* (1) Three respirators with cartridges containing or having attached to them, filters for protection against mists of paints, lacquers, and enamels shall be tested in accordance with the provisions of paragraph (f) of this section.

(2) In addition to the test requirements set forth in paragraph (c)(1) of this section, three such respirators will be tested against each aerosol in accordance with the provisions of paragraphs (d) and (e) of this section.

(d) *Lacquer mist test.* (1) Temperature in the test chamber will be approximately 25 °C.

(2) Continuous airflow through the respirator will be 32 liters per minute for air-purifying respirators, and not less than 115 liters per minute to tight fitting facepieces and 170 liters per minute to loose-fitting hoods and helmets of powered air-purifying respirators.

(3) Airflow through the chamber will be 20–25 air changes per minute.

(4) The atomizer employed will be a No. 64–5 nozzle with setup 3, or equivalent, operating at 69 kN/m.<sup>2</sup> (10 pounds per square inch gage).

(5) The test aerosol will be prepared by atomizing a mixture of one volume of clear cellulose nitrate lacquer and one volume of lacquer thinner. The lacquer described in Federal Specification TT-L-31, October 7, 1953, is an example of an acceptable lacquer. Copies of TT-L-31 may be inspected or obtained from the NIOSH, Certification and Quality Assurance Branch, 1095 Willowdale Road, Morgantown, WV 26505–2888.

(6) The concentration of cellulose nitrate in the test aerosol will be 95–125 milligrams per cubic meter.

(7) The test aerosol will be drawn to each respirator for a total of 156 minutes for air-purifying respirators and 240 minutes for powered air-purifying respirators.

(8) The total amount of unretained mist in the samples taken during testing, weighed as cellulose nitrate, shall